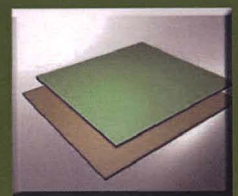


ADVANCES IN COMPOSITE MATERIALS

Iskandar Idris Yaacob
Md Abdul Maleque
Zahurin Halim



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Table of Content

| | |
|---|---|
| Chapter 1 | 1 |
| A Critical Review of Metal Matrix Composite Brake Rotor | |
| | <i>Md Abdul Maleque</i> |
| Chapter 2 | 7 |
| Technology of Moulding for Composite Auto Brake Rotor | |
| | <i>Md Abdul Maleque</i> |
| Chapter 3 | 13 |
| Fabrication of Nickel Aluminide (Ni ₃ Al) by Hot Isostatic Pressing (HIP) | |
| | Faizal Abu Zarim, Iraj Alaei, I.I. Yaacob |
| Chapter 4 | 17 |
| Investigation of Mechanically Alloyed Nd-Fe-B Powder | |
| | I.I. Yacoob and H.K. Jun |
| Chapter 5 | 23 |
| Synthesis And Characterization Of Nanocrystalline Ni ₃ Al Intermetallic Produced by Mechanical Alloying And Reaction Synthesis | |
| | <i>R.Ismail and I.I. Yaacob^b</i> |
| Chapter 6 | 29 |
| The Effect of Hard Nanofillers on Mechanical Properties of PVC Nanocomposites | |
| | <i>Noorasikin Samat, Muhammad Alif Mohd Yusoff and Mohd Shahrul Rizal Bin Zakaria</i> |
| Chapter 7 | 34 |
| Fatigue Fracture Mechanism of PVC/CaCO ₃ nanocomposite | |
| | <i>Noorasikin Samat, Alan Whittle and Mark Hoffman</i> |
| Chapter 8 | 40 |
| Mechanical Behaviour of Eco Core Composite Sandwich Structure | |
| | <i>Norhasnidawani Johari Safiyah Hazwani Abd. Rahim and Zahurin Halim</i> |
| Chapter 9 | 45 |
| Characteristics of Oil Palm Biomass via Mixture of Empty Fruit Bunch (EFB) Fiber and Mesocarp Fiber | |
| | <i>Zahurin Halim, Nabiha Mohd Noh and Nurshazana Mohamad</i> |
| Chapter 10 | 49 |
| Mechanical Behaviour of Oil Palm Empty Fruit Bunch (OPEFB) Albumen-Composites Concrete | |

Afiqah Omar, Nur Humairah A. Razak and Zuraida Ahmad

| | |
|---|-----|
| Chapter 11 | 55 |
| The Influence of Biopolymer and Natural Fiber on the Physical and Mechanical Properties of Cement Composite | |
| <i>Norshahida Sarifuddin and Zuraida Ahmad</i> | |
| Chapter 12 | 62 |
| Thermal and Morphological Study of Biopolymer Cotton-Albumen Clay (BCAC) Composites | |
| <i>Zuraida Ahmad, Teoh Swin Le and Kumaran A/L Samannamuthaliar</i> | |
| Chapter 13 | 68 |
| Effect of Compaction Time on the Properties of Coir Fiber Reinforced Cement-Albumen Composite | |
| <i>Amir Zakwan Roslin, Nur Humairah A. Razak and Zuraida Ahmad</i> | |
| Chapter 14 | 74 |
| Oil Palm Empty Fruit Bunch (OPEFB) for Lightweight Composites Concrete | |
| <i>Afiqah Omar, Nur Humairah A. Razak and Zuraida Ahmad</i> | |
| Chapter 15 | 80 |
| Fabrication of Metal Matrix Composite Automotive Brake Rotor (Part 1) | |
| <i>Md Abdul Maleque</i> | |
| Chapter 16 | 86 |
| Fabrication of Metal Matrix Composite Automotive Brake Rotor (Part 2) | |
| <i>Md Abdul Maleque</i> | |
| Chapter 17 | 90 |
| Wear of Aluminium Matrix Composite – Effects of Reinforcement Combination | |
| <i>Md Abdul Maleque and Rezaul Karim</i> | |
| Chapter 18 | 96 |
| Mechanical Properties of Wood Plastic Composites | |
| <i>Ooi Chong Jin and Shahjahan Mridha</i> | |
| Chapter 19 | 101 |
| Properties of Wood Fiber Reinforced Polypropylene Composite | |
| <i>Shahjahan Mridha and Nafis Sarwar Islam</i> | |

| | |
|--|-----|
| Chapter 20 | 108 |
| The effects of chemical and mechanical treatments on coir fibre to mechanical properties of coir-albumen-concrete | |
| <i>Zuraida Ahmad and Nurizan Omar</i> | |
| Chapter 21 | 114 |
| Architecture of Chopped Fiber Glass in Plastic Composite Processed Under Different Loads | |
| <i>Ahmed Nazrin Md Idriss and Shahjahan Mridha</i> | |
| Chapter 22 | 119 |
| Variation of Fiber Architecture on Loads applied in Fabrication of Epoxy/Woven Fiber Glass Composite | |
| <i>Ahmed Nazrin Md Idriss and Shahjahan Mridha</i> | |
| Chapter 23 | 125 |
| Impact Behavior of Carbon/ Epoxy Composite in Moisture and Temperature environments | |
| <i>Shahjahan Mridha</i> | |
| Chapter 24 | 132 |
| Impact Strength Behaviour of the Woven and Chopped Fiber Glass Composites at Different Temperatures | |
| <i>Ahmed Nazrin Md Idriss and Shahjahan Mridha</i> | |
| Chapter 25 | 138 |
| An Investigation of Hybrid Composites Tubes Subjected to Quasi-Static Loading | |
| <i>Farrah Yussof¹ and Zuraida Ahmad</i> | |
| Chapter 26 | 144 |
| Mechanical Behaviour of Biopolymer Cotton Albumen Clay (BCAC) Composites | |
| <i>Teoh Swin Le, Kumaran A/L Samannamuthaliar and Zuraida Ahmad</i> | |
| Chapter 27 | 150 |
| The Effect of Processing Parameters on Tensile Properties Empty Fruit Bunch (EFB) Fiber Reinforced Thermoplastic Natural Rubber Composites | |
| <i>Noor Azlina Hassan, Norita Hassan, Sahrim Hj. Ahmad and Rozaidi Rasid</i> | |
| Chapter 28 | 155 |
| Manganese Doped Hydroxyapatite Powder through Hydrothermal Method | |
| <i>Asep Sofwan Faturohman, Alqap, Iis Sopyan and Nuur Izzati Mazmaa</i> | |

| | |
|--|-----|
| Chapter 29 | 161 |
| Synthesis and Characterization of Sol-Gel Method Derived Zinc Doped Hydroxyapatite Powder | |
| <i>Asep Sofwan Faturohman Alqap, Nor Hidayu and Iis Sopyan</i> | |
| Chapter 30 | 167 |
| Synthesis and Characterization of Nickel Iron–Silicon Nitride Nanocomposite | |
| <i>Iskandar I. Yaacob</i> | |
| Chapter 31 | 172 |
| Fabrication of Nickel Aluminide Intermetallic-Alumina Nanocomposite | |
| <i>Roslina Ismail and Iskandar I. Yaacob</i> | |
| Chapter 32 | 178 |
| Investigation on the Effect of Water Immersion on Cotton Albumen Composite | |
| <i>Zahurin Halim, Zuraida Ahmad and Fauziah Md Yusof</i> | |
| Chapter 33 | 182 |
| Numerical and Experimental Investigation of Peel Strength of Composite Sandwich Structures | |
| <i>Zahurin Halim , Shahnor Basri and Mohd Ramli Ajir</i> | |
| Chapter 34 | 190 |
| Finite Element Analysis of Interlaminar Stresses in Edge Delamination | |
| <i>Zahurin Halim and Meor Mohd. Adli Taib</i> | |

An Investigation of Hybrid Composites Tubes Subjected to Quasi-Static Loading

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Keywords: Composites, hybrid, carbon fiber, glass fiber, compressive load.

Abstract: In this chapter, the results of experimental works pertaining to the crash behaviour, collapse modes and energy absorption capability of hybrid composites that were subjected to quasi-static axial compressive loading are presented. The tested specimens were featured by a material combination of carbon fibers and glass fibers in thermosetting epoxy resin. Two stacking sequence of the hybrid composites were selected. These hybrids composites were hybrid with carbon fiber in the inner side and glass fiber in the outer side of tubes (HBCG) and vice versa (HBGC). These hybrids tubes were compressed under the load of 1000kN. The influence of the most important specimen such as the tube axial length, wall thickness on the compressive response and collapse modes of the tested tubes is thoroughly analysed. In addition, the effect of laminate materials properties such as the fiber volume content and stacking sequence on the energy absorbing capability of the thin walls is also examined. Results show that stacking the sequence influence the collapse mode of the hybrid tubes. Independently of the collapse mode, the peak compressive load increases significantly as the number of fiber reinforcing layers, fiber volume content and thickness of the axially compressed tubes increases.

Introduction

Composites tubes are found to be excellent crashworthy structures due to their superb energy absorption performance during the progressive crushing under axial loadings. Several types of crashworthy components in the forms of different material systems, various geometrical shapes and multifarious fabrication methods were developed and subjected to axial compression examinations [1-5]. However, only a few works focused on the for hybrid composites axial crushing performance can be retrieved [6-7].

The main reason for the study in this area is due to ability to combine the two or more types of reinforcement in such a way as to tailor the material to the exact needs of application [7]. Based on the fact that advantages found with one type of fiber can be used to complement the poor performance of other type for a particular property, the crushing behaviour of structure made of carbon fiber reinforced polymer composites can be optimized by hybridization with glass fiber reinforced polymer composites. Chiu et al [7] investigated the crush failure modes of two-dimensional triaxially braided hybrid composite tubes. It is observed that the crush failure modes and energy absorption of the braided composites were strongly influenced by the fiber types and their hybrid kind. The objective of this work is to